AYK REGION

NS/K ESC. REPORT # 8

# KWINIUK RIVER SALMON COUNTING TOWER REPORT

1971

Charles L. Hurd
Area Management Biologist

Alaska Department of Fish and Game
Division of Commercial Fisheries
Nome, Alaska

# KWINIUK RIVER COUNTING TOWER PROJECT, 1971

## INTRODUCTION

A salmon counting tower project was initiated in 1965 on the Kwiniuk River 110 miles east of Nome (Figure 1). The seventh season of operation was completed in 1971. The Kwiniuk River, similar to other major rivers in Norton Sound, receives moderate runs of chum and pink salmon which are harvested by subsistence and commercial fishermen. To effectively manage the Norton Sound Fisheries, it is important that frequent estimates of escapement during the season be obtained by either tower counts or aerial survey counts. The tower count is the more precise method and provides a check on the aerial surveys conducted.

## OBJECTIVES

The 1971 project objectives were to:

1. Obtain daily and seasonal timing and magnitude of salmon escapements.

2. Determine the travel time required for salmon to migrate from the mouth of the Kwiniuk River, near the commercial fishery, to the tower site.

3. Check 1970 salmon redds for the presence of unhatched eggs and sac fry.

4. Evaluate aerial survey estimates by comparison with counting tower enumerations of salmon escapements.

5. Periodically sample the Moses Point commercial salmon fishery and the escapement populations for age, sex and size information.

6. Determine a satisfactory location for a weir on the Kwiniuk River.

7. Conduct late season carcass surveys of the Tubutulik and Kwiniuk Rivers to compare species composition.

## METHODS AND MATERIALS

A portable 20-foot aluminum counting tower was erected adjacent to the river upon a 30 foot high bank at the same location used since 1965, approximately five miles above the river mouth.

A 25-fathom beach seine was used to block a secondary channel formed by a mid-river sand bar located across the main channel from the tower.

A power line with three 400-watt incandescent light bulbs housed in 18-inch diameter reflectors was strung across the main channel to provide illumination during darkness. A 1250-watt generator provided electric current for the lights.

A three-man crew began 18 hour counting operations on June 26 and terminated counting operations on July 29, 1971. Each crew member counted salmon for two 3-hour shifts daily from 1200 until 0600 the next day. Hourly counts were totaled. Salmon moving downstream and salmon caught above the tower for subsistence purposes were subtracted from the total count.

Chums were captured by seine at the mouth of the river, marked by plastic surveyor's marking tape (4 ft.) tied around the base of the tail, and released. The time of release was recorded and the time the fish were observed at the tower, five miles upstream, was recorded. Salmon were tagged and released in this manner in four different weeks. A different tape color was used each week.

Prior to the 1971 adult salmon migration, salmon redds near the tower were excavated by shovel. Eggs and fry which were still present in the gravel were caught and removed from the water with a fine mesh nylon net. The estimated volume of excavated gravel and the number of eggs and fry contained was recorded.

One aerial survey of the Kwiniuk River was conducted from a chartered Cessna 180 aircraft.

The commercial fishery catches were periodically sampled for age, sex and size information at the buying station near the river mouth. The escapement population was sampled near the tower site using a beach seine to capture the fish.

The three-man crew, using conventional measuring equipment, located a satisfactory weir site.

A carcass survey was made of the Tubutulik River from a point approximately one mile below Chukajak Creek to the mouth of the main river on July 30-31. A similar survey was made on the Kwiniuk River from a point about 20 miles above the tower to the tower site on August 1. The surveys were conducted by two men in an outboard-powered aluminum canoe.

## RESULTS AND DISCUSSION

### Estimates of Escapements from Tower Counts

In 1971 a total of 38,243 chums and 16,151 pinks were counted past the tower. Based upon research data from 1965-1969, the average chum salmon escapement during the six hours from 0600 until 1200 was 2.1 percent of the total run (591). Using these figures, the expanded total escapements were 39,046 chums and 16,742 pinks. The above tower subsistence catch totals were 367 chums and 108 pinks. Final escapement totals are 38,679 chums and 16,634 pinks. Daily cumulative counts for 1965-1971 are presented in Appendix Table 1.

The main peaks of the chum run occurred during the periods July 8-12 and July 16-20, while the peaks of the pink run passed the tower during the periods July 10-12 and July 17-20 (Figure 2). The daily chum run was heaviest from 1600 to 2400 with the largest counts occurring from 2100 to 2200. The pink migration was greatest during a similar period, 1500 to 0100, with the peak occurring from 2100 to 2200 (Table 1).

The chum and pink salmon average daily peak of migration for the years 1965-1969 was greatest between the hours of 1900 and 2000 (Appendix Table 2).

The 1971 chum salmon escapement was the second highest ever recorded. The pink salmon escapement was fourth from the lowest recorded. Total chum and pink escapements for 1965-1971 are presented in Appendix Table 3.

### Commercial Fishery Catches

In 1971 the Moses Point commercial harvest of chums was the greatest ever recorded (43,456) with the peak of the catch occurring July 16 and a smaller peak on July 6 (Table 2). The pink salmon harvest was the poorest ever recorded (910) with the peak occurring on July 17. These dates correspond closely with the Kwiniuk River migration patterns (Figure 2). The economics involved in the Moses Point area's pink salmon fishery, i.e., lower return per weight of transported fish, uncertain market, etc., has kept the commercial harvest of this species to a minimum as compared to escapement for the past several years.

### Chum Escapement Predictions Based upon Tower Count Data

Determination of the 1967 brood year chum survival rate based upon known survival rate of the same brood year of pinks, which returned in

1969, was tested.[1/] Four years of Kwiniuk tower counts provided the basic data for comparison.[2/] Estimate number two of the 1970 regression analysis (39,580) was within 1.3 percent of the 1971 expanded escapement figure (39,046). This method assumes that the vast majority of chum salmon return as four-year-old fish. Sampling data indicates that this was the case for the years 1965, 1966, 1967, 1969 and 1970 when the age composition averaged 86 percent four year olds. However, in 1968 approximately 61 percent were five year olds. Also, this method does not allow for greatly fluctuating commercial harvest rates. At present effort and harvest levels this should not affect the results to a noticeable degree but may in the future when significant changes in effort, efficiency and methods of the commercial fishermen may occur. Unaccounted for survival factors may also affect the reliability of future prediction results. The regression data and prediction figures for 1972 and 1973 are presented below.

KWINIUK RIVER ESCAPEMENT DATA

| | X | Y | |
|---|---|---|---|
| Year | Pink Escapement | Chum Escapement | Year |
| 1965[3/] | 15,834 | 26,661 | 1967 |
| 1966 | 10,864 | 16,958 | 1968 |
| 1967 | 3,587 | 19,687 | 1969 |
| 1968 | 128,580 | 68,004 | 1970 |
| 1969 | 56,683 | 39,046 | 1971 |
| 1970 | 235,131 | Est. 110,112 | 1972 |
| 1971 | 16,742 | Est. 23,630 | 1973 |

$r = .991$

Given: $\Sigma x = 215.548 \times 10^3$ $\quad \Sigma y = 170.356 \times 10^3$

$\bar{x} = 43.109 \times 10^3$ $\quad \bar{y} = 34.071 \times 10^3$

$\Sigma(x-\bar{x})(y-\bar{y}) = 4290.22 \times 10^6$ $\quad N = 5$

$\Sigma(x-\bar{x})^2 = 10835.20 \times 10^6$

$Y = a + ByxX$

$Y = 17.000 \times 10^3 + .396X =$ 1972: 110,112 and 1973: 23,630

The correlation coefficient for this data is again quite high, .991 of a possible 1.000 for a straight line relationship.

The 1972 estimated escapement of 110,112 chums for the Kwiniuk River is about six times the parent year escapement and indicates the possibility of excellent survival for the 1968 year class.

1/ Method described in Forecasting Chum Salmon Returns Based upon Pink Salmon Abundance of the Same Brood Year, 1966. Mattson, Chester R., USBCF.

2/ Kwiniuk Tower Report, 1970.

3/ The 1965 tower count was terminated before the end of the salmon run. The actual count of 8,668 pinks was expanded to include the percentage of pinks which pass the tower on an average year after July 19.

## Travel Time of Chum Salmon

Travel times of chum salmon tagged near the river mouth are presented in Table 3. Of 24 salmon tagged near the river mouth, 16 were observed from the tower, five miles upriver. The fastest travel time was 18.3 hours, the slowest was 139.3 hours and the average time was 57.2 hours. The wide variation in travel times between individuals in the first group tagged on July 5 (25.1-139.3 hours) was probably due in part to mixed river area stocks and early season milling. The second group tagged on July 14 showed less variation (51.2-69.9 hours) and passed the tower on the highest chum count day, possibly all headed for the same general spawning area. The third group tagged on July 19 made the fastest time and had the smallest variation (18.3-20.6 hours). Four individuals from this group of seven were not accounted for and possibly spawned below the tower. Milt and eggs flowed freely from chums seined in the river near the tower on July 20. Of the last group of four tagged on July 25, only one chum was observed at the tower (25.3 hours) and it went back downstream. This group possibly spawned below the tower.

This data indicates that the majority of later running chums spawn in the lower portions of the river. More intensive research would be required to determine if this is actually the case.

This experiment should be repeated until results are statistically sound, at which time daily counts can be more closely correlated with daily commercial fishing catches for a more refined day to day management of the commercial fishery.

## Excavation of 1970 Salmon Redds

It would be useful to know when salmon fry leave the gravel and migrate to the ocean at more northern latitudes. As a basic step, several 1970 salmon redds were excavated in June. The results are shown in Table 4. Eggs were present in all redds excavated; however, the percentage of viable eggs was not definitely determined. This experiment should be repeated with better equipment in 1972 and the viability of eggs and sac fry should be determined.

## Aerial Survey Estimate Compared to Tower Count

A late aerial survey of the entire Kwiniuk River was conducted on August 10, 1971. A total of 800 chum, 60 pinks and 5,892 carcasses was tallied on that portion of the river above the tower. The cumulative tower count through July 29 was 38,243 chums and 16,151 pinks. The aerial survey should have been conducted earlier in the season for a direct comparison of escapement totals. However, the results may be useful in estimating escapements based upon late season aerial survey counts of other streams in the area.

## Population Sampling--Age, Sex and Length Data

A total of 540 chums was sampled from the Moses Point commercial fishery and 508 chums were collected by beach seine from the spawning population of the river to obtain age, sex and length data. The scales collected were aged and the data tabulated in the Northern Region Salmon Age, Sex and Size Data Report, 1971.

## Basic Plans for Weir Location

The site selected for a possible weir on the Kwiniuk River is located 150 yards downstream from the present tower site. Figure 3 shows the stream profile at this location.

## Carcass Surveys of the Tubutulik and Kwiniuk Rivers

Carcass survey results and results of other surveys are listed below for comparison.

| | 1971 | | | | 1970 | | |
|---|---|---|---|---|---|---|---|
| Enumeration method | Kwiniuk R. tower 7/29 | Kwiniuk R. carcass 8/1 | Tubutulik R. aerial 7/20 | Tubutulik R. carcass 7/31 | Kwiniuk R. tower 7/29 | Tubutulik R. aerial 7/25 | Tubutulik R. carcass 7/30 |
| No. of chums | 39,046 | 1,249 | 16,820 | 1,150 | 68,004 | 38,200 | 1,234 |
| No. of pinks | 16,742 | 402 | 7,500 | 797 | 235,131 | 136,590 | 6,995 |
| Species Ratio | 2.33:1 | 3.11:1 | 2.24:1 | 1.44:1 | 1:3.46 | 1:3.57 | 1:5.67 |

The Tubutulik River aerial survey ratios correspond closely with the Kwiniuk River tower count ratios for both years.

No definite conclusions can be arrived at, based upon this limited data. However, the figures above do indicate possible differences in the species composition of the spawning populations of the two rivers, i.e., higher proportion of pink salmon in the Tubutulik River, and also, the possibility of a correlation between species ratios obtained from aerial survey counts of the Tubutulik River and these derived from the Kwiniuk River tower count.

## SUMMARY

1. For the seventh consecutive year a counting tower project on the Kwiniuk River, a typical Norton Sound salmon stream, was operated primarily for the purpose of obtaining the daily and seasonal timing and magnitude of the salmon runs which can generally be applied toward management of the Norton Sound fisheries.

2. An expanded total of 39,046 chums and 16,742 pink salmon were recorded as passing the tower in 1971. The peaks of the chum run occurred on July 8-12 and July 16-20, while the pink run peaked during the periods of July 10-12 and July 17-20. The 1971 counts were the second highest for chums and the fourth poorest for pinks.

3. Chums tagged at the mouth of the Kwiniuk River took an average of 57.2 hours to travel the five miles up to the tower site.

4. Salmon redds from 1970 were found to contain eggs and live sac fry in late June 1971.

5. Figures obtained from an aerial survey, which was conducted too late in the season for direct comparison of tower escapement totals, may be useful in estimating escapements from late season aerial survey counts.

6. Age, sex and size data was collected from both the commercial fishery and the spawning escapement population.

7. A satisfactory weir site was located.

8. Carcass surveys of the Kwiniuk and Tubutulik Rivers yielded ratios of chums to pinks of 3.11:1 and 1.44:1 respectively.

Figure 1. Map of the Kwiniuk River, Alaska

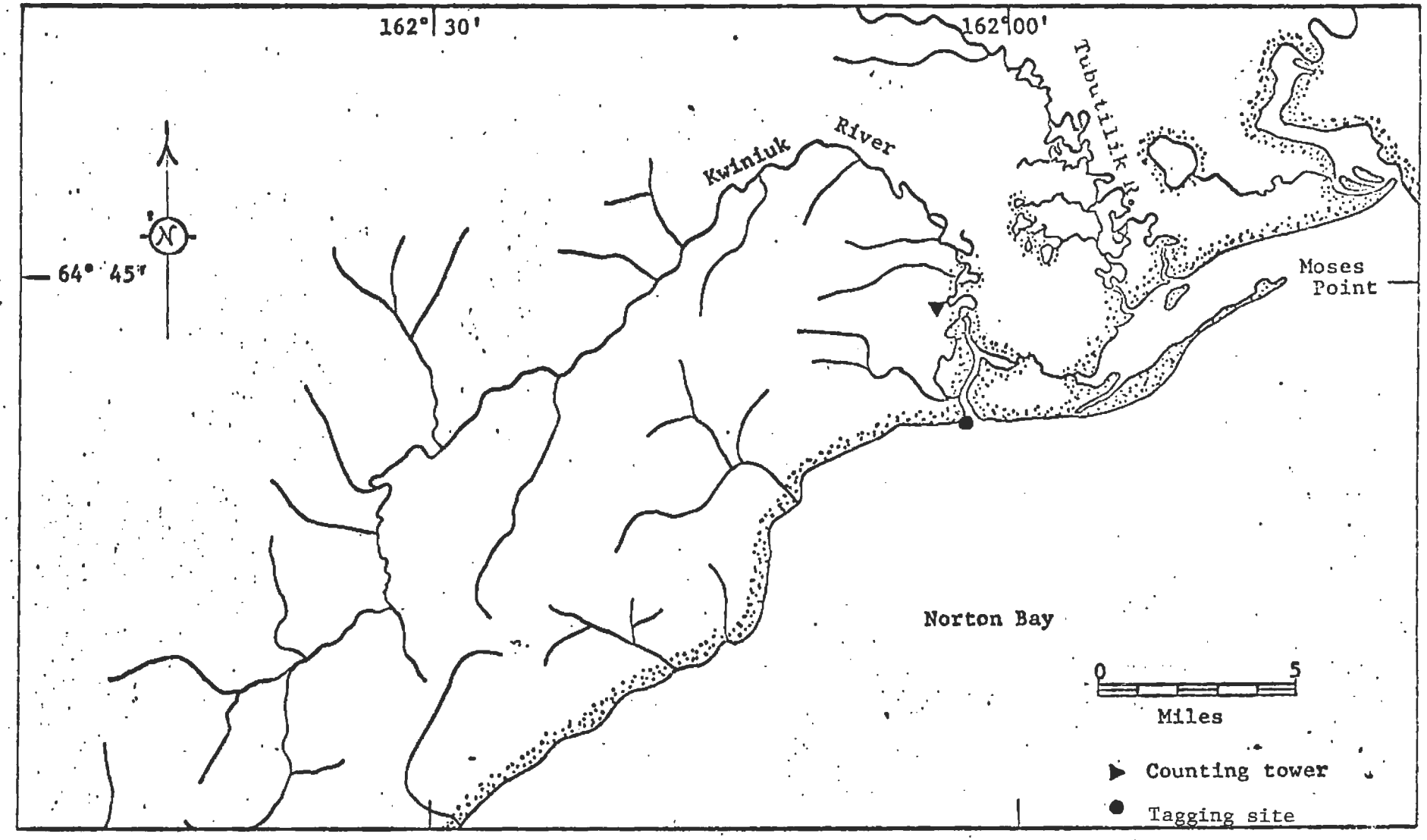


Figure 2. Daily migration patterns of chum and pink salmon, Kwiniuk River, 1971.

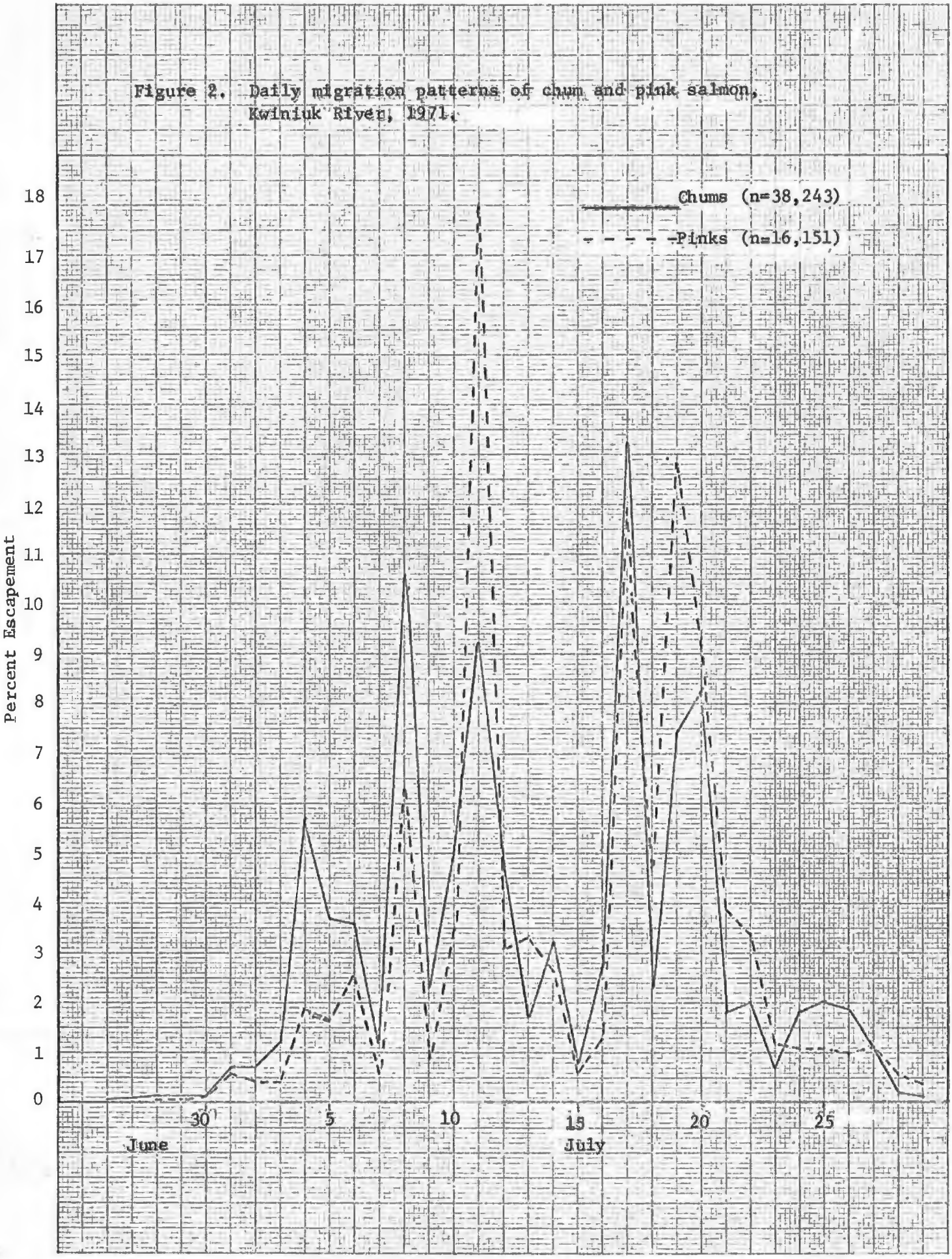
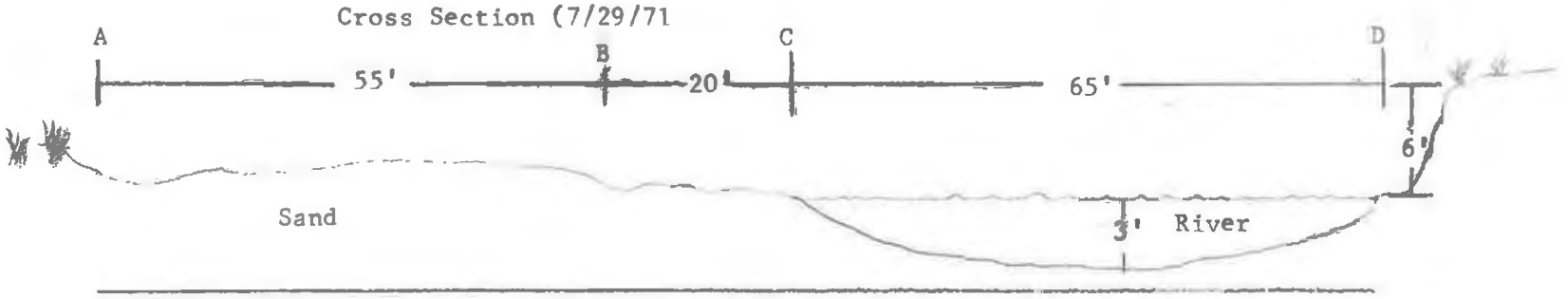


Figure 3. Possible Weir Site, Kwiniuk River




During extreme high tides entire cross section (A to D) is under water. Normal high tides cover sand bar from B to C. This stretch of sand is not firm and may present a wash-out problem. Weir should extend from B to D (85'). A beach seine, wire fence or other obstruction could be erected between A and B to block fish movement during extreme high tides. The angle of wier construction and the location of upstream and downstream traps and a central boat gate would be best determined at the time of construction. The upstream trap should be near the bank at point D and the boat gate near the middle of the river where the bottom is deepest.

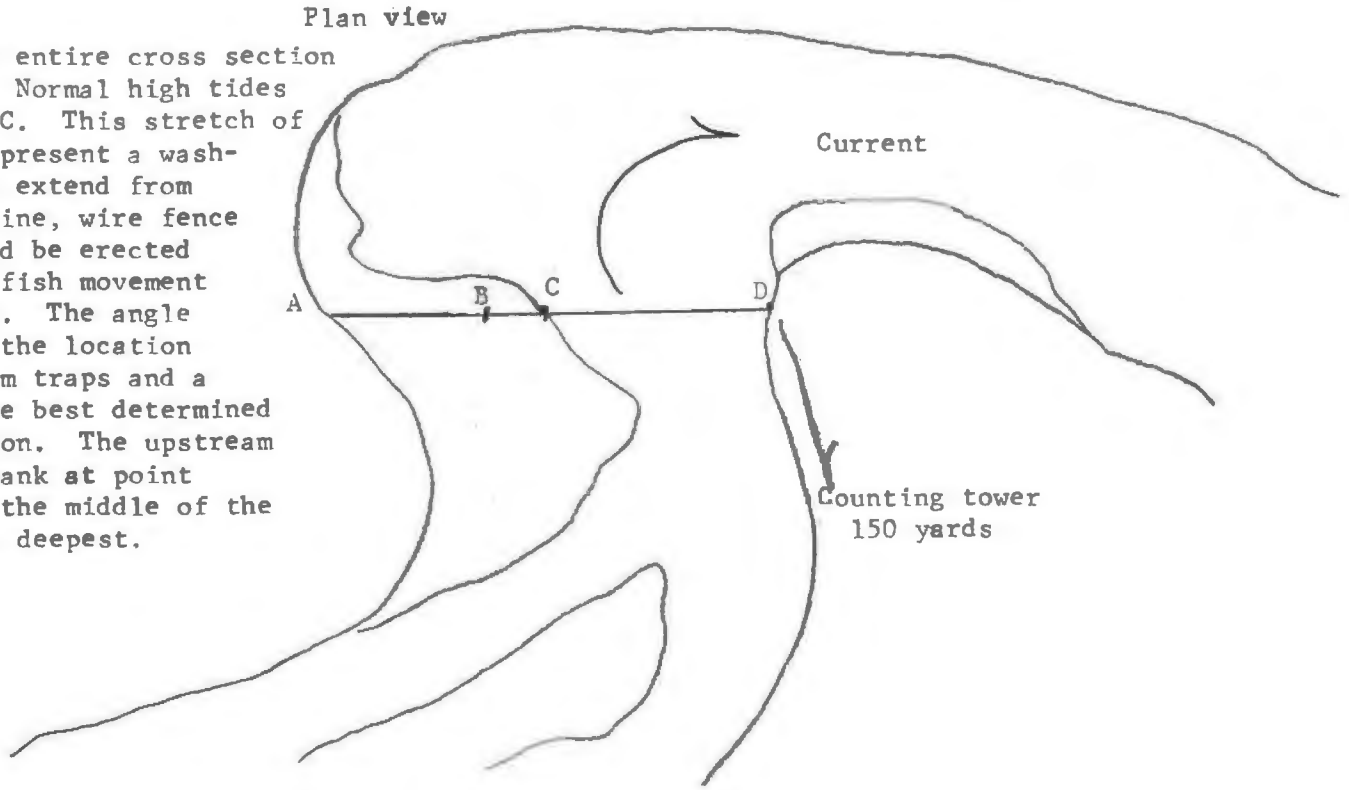


Table 1. Kwiniuk River daily - hourly counts and percentages, 1971. Species: CHUM

| Hour | 0 | 1 | 2 | 3 | 4 | 5 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | Daily Total | % Of Total Run |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | | | | | | | | | | | | | | | | | | | | |
| June 26 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 23 | 23 | 0.06 |
| 27 | 15 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 13 | 28 | 0.07 |
| 28 | 16 | 18 | - | - | - | - | - | - | - | - | - | - | - | 2 | - | - | 6 | 2 | 44 | 0.12 |
| 29 | 25 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 12 | 7 | 44 | 0.12 |
| 30 | 32 | 2 | 4 | - | 6 | 5 | - | - | - | - | - | - | - | - | - | - | 8 | - | 57 | 0.15 |
| July 1 | 4 | - | 1 | - | - | 1 | - | - | - | - | - | - | - | - | 30 | 22 | 141 | 57 | 256 | 0.7 |
| 2 | 28 | -1 | - | - | - | - | - | - | - | - | - | 2 | - | 5 | 25 | 41 | 176 | - | 276 | 0.7 |
| 3 | 32 | 16 | -3 | - | - | - | - | 6 | - | 2 | -1 | 130 | 40 | 21 | 32 | 163 | - | 15 | 453 | 1.2 |
| 4 | 13 | 22 | 1 | 9 | - | - | - | - | 98 | 9 | 39 | 657 | 237 | 396 | 262 | 251 | 59 | 128 | 2181 | 5.7 |
| 5 | 11 | 4 | 23 | 6 | - | - | 19 | 52 | 1 | 60 | 144 | 224 | 486 | 117 | 27 | 25 | 201 | 21 | 1421 | 3.7 |
| 6 | 37 | 14 | 9 | 4 | 1 | - | - | 24 | - | 10 | 48 | 95 | - | 35 | 53 | 452 | 380 | 233 | 1395 | 3.6 |
| 7 | - | 12 | - | 1 | 4 | - | 1 | - | - | - | - | 14 | - | 83 | 112 | 129 | 75 | 42 | 473 | 1.2 |
| 8 | 14 | 364 | 3 | 1 | 19 | 12 | - | - | - | 146 | 231 | 217 | 337 | 235 | 239 | 1606 | 495 | 107 | 4026 | 10.5 |
| 9 | 326 | 73 | 25 | 60 | 1 | - | 5 | 11 | 27 | 107 | 139 | 49 | 12 | 15 | 18 | - | 1 | -7 | 862 | 2.3 |
| 10 | 32 | 4 | 2 | 1 | - | - | 45 | 19 | 178 | 710 | 520 | 111 | 115 | 85 | 17 | - | 16 | 7 | 1862 | 4.9 |
| 11 | -268 | -5 | 3 | 14 | 19 | - | -2 | 4 | 221 | 645 | 509 | 1160 | 255 | 720 | 91 | 24 | -9 | 120 | 3501 | 9.2 |
| 12 | -20 | -4 | 5 | -2 | -16 | -1 | -9 | -47 | -4 | 19 | 243 | 240 | 162 | 203 | 246 | 179 | 272 | 326 | 1792 | 4.7 |
| 13 | 163 | 43 | 17 | 48 | 36 | 26 | 110 | -104 | -5 | -20 | 34 | 65 | 37 | 26 | 25 | 25 | 79 | 47 | 652 | 1.7 |
| 14 | 27 | -143 | -459 | -103 | -63 | -71 | -1 | - 5 | -15 | 63 | 43 | 36 | 60 | 73 | 426 | 985 | 243 | 124 | 1220 | 3.2 |
| 15 | 64 | 53 | 42 | 41 | 22 | -2 | 1 | 1 | - | 3 | 13 | - | 16 | 14 | 21 | 14 | -14 | 3 | 292 | 0.8 |
| 16 | 5 | 15 | 11 | 4 | 6 | - | 10 | 2 | 4 | 8 | 28 | 176 | 60 | 140 | 59 | 57 | 40 | 426 | 1051 | 2.7 |
| 17 | 371 | 185 | 197 | 115 | 132 | 12 | 511 | 25 | 13 | 133 | 976 | 992 | 328 | 338 | 162 | 307 | 230 | 19 | 5046 | 13.2 |
| 18 | 55 | 40 | 98 | 115 | 51 | 4 | 10 | 2 | 2 | - | - | 16 | 6 | 49 | 108 | 129 | 20 | 176 | 881 | 2.3 |
| 19 | 208 | 99 | 42 | 22 | 11 | 10 | 3 | 35 | 1 | 67 | 262 | 329 | 149 | 338 | 303 | 482 | 162 | 321 | 2844 | 7.4 |
| 20 | 84 | 109 | 66 | 12 | 11 | 10 | 484 | 887 | 499 | 410 | 109 | 27 | 16 | 137 | 51 | 9 | 37 | 162 | 3120 | 8.2 |
| 21 | 81 | 29 | 18 | 6 | 8 | 11 | - | 1 | - | - | 1 | 2 | 104 | 13 | 2 | 67 | 163 | 167 | 673 | 1.8 |
| 22 | 124 | 33 | 48 | 13 | 11 | 4 | 5 | - | - | 3 | 1 | - | 11 | 64 | 181 | 122 | 92 | 52 | 764 | 2.0 |
| 23 | 31 | 34 | 8 | 4 | 2 | 7 | 5 | - | 2 | - | 7 | 14 | -1 | 10 | 43 | 11 | 60 | 36 | 273 | 0.7 |
| 24 | 2 | 11 | 6 | 14 | 4 | 1 | - | 16 | - | - | 1 | -1 | - | 185 | 221 | 89 | 29 | 97 | 675 | 1.8 |
| 25 | 40 | 11 | 48 | 32 | 3 | 3 | 1 | -2 | 3 | 10 | 30 | 69 | 165 | 77 | 5 | 4 | 76 | 199 | 774 | 2.0 |

Table 1. (continued) Kwiniuk River daily - hourly counts and percentages, 1971 Species: CHUM

| Hour | 0 | 1 | 2 | 3 | 4 | 5 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | Daily Total | % of Total Run |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | | | | | | | | | | | | | | | | | | | | |
| July 26 | 80 | 100 | 5 | 7 | 3 | 13 | - | 1 | - | 10 | - | - | 118 | 77 | 206 | 46 | 23 | 32 | 721 | 1.9 |
| 27 | 70 | 28 | 15 | 46 | 2 | 2 | - | - | 9 | - | 1 | 7 | 9 | 22 | 35 | 86 | 40 | 55 | 427 | 1.1 |
| 28 | 14 | 21 | 11 | 13 | 1 | - | - | - | - | 4 | 1 | 5 | - | 1 | 5 | 2 | 4 | -3 | 79 | 0.2 |
| 29 | 24 | 5 | 10 | 9 | 1 | - | - | - | - | - | - | - | 1 | 2 | - | 5 | - | - | 57 | 0.15 |
| Hourly TOTALS | 1740 | 1192 | 256 | 492 | 275 | 47 | 1198 | 928 | 1034 | 2399 | 3379 | 4636 | 2723 | 3483 | 3005 | 5332 | 3117 | 3007 | 38,243 | 100.07 |
| % of Total Run | 4.5 | 3.1 | 0.7 | 1.3 | 0.7 | 0.1 | 3.1 | 2.4 | 2.7 | 6.3 | 8.8 | 12.1 | 7.1 | 9.1 | 7.9 | 13.9 | 8.2 | 7.9 | | 99.90 |

Species: PINK

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| June 26 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 27 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 28 | - | - | - | - | - | - | - | - | - | - | - | - | - | 2 | 7 | - | - | - | 9 | 0.06 |
| 29 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 3 | - | - | - | 3 | 0.02 |
| 30 | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 7 | 10 | 19 | 0.12 |
| July 1 | 12 | - | 8 | - | - | - | - | - | - | - | - | - | - | - | 11 | - | 43 | 20 | 94 | 0.6 |
| 2 | 11 | 5 | - | - | - | - | - | - | - | - | - | - | 3 | - | 12 | 4 | 22 | - | 57 | 0.4 |
| 3 | 8 | 7 | -10 | - | - | - | - | - | - | 4 | - | 2 | 3 | 7 | 1 | 35 | - | 2 | 59 | 0.4 |
| 4 | 1 | 3 | 3 | 2 | - | - | - | - | 2 | 1 | 4 | 70 | 2 | 40 | 33 | 73 | 22 | 55 | 311 | 1.9 |
| 5 | 2 | 3 | 2 | - | - | 1 | - | 2 | 1 | 4 | 5 | 14 | 124 | 42 | 19 | 7 | 38 | 3 | 267 | 1.7 |
| 6 | 12 | 4 | 4 | 6 | - | - | - | 3 | - | 1 | 4 | 6 | 1 | 5 | 65 | 111 | 116 | 64 | 402 | 2.5 |
| 7 | - | 1 | - | - | 1 | - | - | - | - | - | - | 2 | - | 11 | 11 | 23 | 36 | 21 | 106 | 0.6 |
| 8 | 2 | 51 | 1 | 1 | 1 | - | - | - | - | 14 | 3 | 13 | 17 | 26 | 63 | 500 | 277 | 47 | 1016 | 6.3 |
| 9 | 59 | 8 | 5 | 24 | - | 1 | 6 | 1 | 3 | 7 | 15 | 1 | 5 | 5 | 13 | 3 | 2 | -11 | 147 | 0.9 |
| 10 | 10 | 3 | - | - | - | - | 9 | - | 22 | 66 | 165 | 67 | 81 | 57 | 19 | 2 | 12 | 58 | 571 | 3.5 |
| 11 | -136 | -2 | 1 | 4 | 16 | 2 | -1 | 3 | 32 | 277 | 291 | 789 | 190 | 1265 | 74 | 12 | 1 | 84 | 2902 | 18.0 |
| 12 | 5 | -3 | - | - | -4 | 1 | 3 | -6 | -1 | 28 | 78 | 52 | 30 | 34 | 59 | 54 | 65 | 104 | 499 | 3.1 |

Table 1. (continued) Kwiniuk River daily - hourly counts and percentages, 1971 Species: PINK

| Hour | 0 | 1 | 2 | 3 | 4 | 5 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | Daily Total | % of Total Run |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | | | | | | | | | | | | | | | | | | | | |
| July 13 | 42 | 21 | 5 | 14 | 19 | 6 | 31 | 24 | -2 | 1 | 9 | 32 | 5 | 91 | 6 | 40 | 94 | 94 | 532 | 3.3 |
| 14 | 10 | -55 | -109 | -20 | -10 | -27 | -4 | -1 | -1 | 19 | 4 | 5 | 15 | 22 | 106 | 306 | 108 | 56 | 424 | 2.6 |
| 15 | 12 | 21 | 20 | 6 | 7 | 2 | 1 | -- | -- | 2 | 1 | - | - | 9 | 7 | 5 | 1 | 7 | 101 | 0.6 |
| 16 | 6 | 8 | 8 | 4 | 1 | - | - | - | - | 2 | 5 | 17 | 2 | 24 | 25 | 19 | 7 | 85 | 213 | 1.3 |
| 17 | 79 | 28 | 15 | 17 | 30 | 3 | 45 | 5 | 3 | 32 | 143 | 197 | 334 | 298 | 140 | 181 | 339 | 25 | 1914 | 11.9 |
| 18 | 78 | 44 | 43 | 95 | 58 | 2 | 11 | 4 | 1 | 13 | 1 | 19 | 8 | 39 | 50 | 117 | 31 | 141 | 755 | 4.7 |
| 19 | 395 | 103 | 49 | 42 | 43 | 40 | 2 | 11 | 3 | 31 | 42 | 76 | 73 | 121 | 262 | 441 | 144 | 191 | 2069 | 12.8 |
| 20 | 121 | 84 | 35 | 45 | 8 | 11 | 111 | 214 | 227 | 103 | 52 | 55 | 29 | 87 | 72 | 19 | 41 | 154 | 1468 | 9.1 |
| 21 | 55 | 31 | 8 | 1 | 13 | 18 | - | - | 4 | - | 6 | 1 | 16 | 9 | 1 | 166 | 187 | 117 | 633 | 3.9 |
| 22 | 99 | 15 | 15 | 3 | 3 | 2 | 4 | - | - | 4 | 1 | 10 | 17 | 71 | 72 | 129 | 65 | 42 | 552 | 3.4 |
| 23 | 18 | 20 | 2 | 3 | 2 | 3 | 2 | 3 | 7 | - | 12 | 17 | -- | 5 | 27 | 26 | 24 | 15 | 186 | 1.2 |
| 24 | 9 | -- | 10 | 6 | 4 | - | - | 4 | - | 1 | - | -1 | 10 | 11 | 47 | 31 | 15 | 29 | 176 | 1.1 |
| 25 | 13 | 10 | 7 | 8 | 2 | 3 | 1 | - | - | 3 | 14 | 22 | 30 | 10 | 12 | 12 | 10 | 16 | 173 | 1.1 |
| 26 | 20 | 22 | 1 | 3 | 2 | 4 | - | - | - | 2 | - | - | 11 | 16 | 21 | 15 | 24 | 19 | 160 | 1.0 |
| 27 | 35 | 9 | 4 | 6 | - | 1 | - | - | - | - | - | 4 | 6 | 20 | 10 | 41 | 19 | 23 | 178 | 1.1 |
| 28 | 7 | 5 | 5 | 17 | 20 | 3 | - | 2 | 1 | 1 | - | 6 | - | 6 | 2 | 8 | 6 | 4 | 93 | 0.6 |
| 29 | 11 | 2 | 8 | 2 | 3 | - | - | 4 | - | 1 | - | 26 | - | - | 4 | - | -- | 1 | 62 | 0.4 |
| Hourly Totals | 998 | 448 | 140 | 289 | 219 | 76 | 221 | 273 | 302 | 617 | 855 | 1502 | 1012 | 2333 | 1254 | 2380 | 1756 | 1476 | 16151 | 100.2 |
| % of Total Run | 6.2 | 2.8 | 0.9 | 1.8 | 1.4 | 0.5 | 1.4 | 1.7 | 1.9 | 3.8 | 5.3 | 9.3 | 6.3 | 14.4 | 7.8 | 14.7 | 10.9 | 9.1 | | 100.2 |

Table 2. Moses Point subdistrict (Norton Sound district) commercial catches by date, 1971.

| Date | Chum | Pink |
|---|---|---|
| 6/29 | 192 | ---- |
| 6/30 | 261 | ---- |
| 7/2 | 2,600 | ---- |
| 7/3 | 2,286 | ---- |
| 7/6 | 5,792 | 134 |
| 7/7 | 5,408 | 55 |
| 7/8 | 581 | 19 |
| 7/9 | 4,881 | 60 |
| 7/10 | 3,604 | 28 |
| 7/13 | 60 | ---- |
| 7/14 | 3,404 | 97 |
| 7/15 | 604 | 8 |
| 7/16 | 7,992 | 315 |
| 7/17 | 4,137 | 184 |
| 7/20 | 527 | 5 |
| 7/21 | 325 | 5 |
| 7/23 | 289 | ---- |
| 7/24 | 69 | ---- |
| 7/27 | 278 | ---- |
| 7/28 | 166 | ---- |
| Totals | 43,456 | 910 |

Table 3. Travel times of tagged chums, Kwiniuk River, 1971.[1/]

| Tag Color | No. Tagged | Date and Time of Release | Date and Time at Tower | Travel Time (Hours) | Travel Rate (Hours per mile) | Average Travel Rate |
|---|---|---|---|---|---|---|
| Orange | 7 | 7/5 - 2000 | 7/6 - 2154 | 25.9 | 5.2 | 15.2 |
| | | | 7/6 - 2316 | 27.3 | 5.4 | |
| | | | 7/8 - 2105 | 73.1 | 14.6 | |
| | | | 7/8 - 2340 | 75.7 | 15.1 | |
| | | | 7/10- 1530 | 115.5 | 23.1 | |
| | | | 7/11- 1520 | 139.3 | 27.9 | |
| | | | (1 caught commercially in front of FAA station - 0600 - 7/10) | | | |
| Yellow | 6 | 7/14 - 2320 | 7/17 - 0233 | 51.2 | 8.5 | 12.4 |
| | | | 7/17 - 0323 | 52.1 | 8.7 | |
| | | | 7/17 - 1737 | 66.3 | 11.1 | |
| | | | 7/17 - 1746 | 66.4 | 11.1 | |
| | | | 7/17 - 1758 | 66.6 | 11.1 | |
| | | | 7/17 - 2118 | 69.9 | 11.7 | |
| Red | 7 | 7/19 - 1920 | 7/20 - 1335 | 18.3 | 3.7 | 4.0 |
| | | | 7/20 - 1545 | 20.4 | 4.1 | |
| | | | 7/20 - 1558 | 20.6 | 4.1 | |
| White | 4 | 7/25 - 1945 | 7/26 - 2115 | 25.3 | 5.1 | 5.1 |
| TOTALS | 24 | | 16 | $\frac{913.9}{16} = 57.2$ | ——— | 11.5 |

1/ Captured, tagged and released near the commercial fishery at the mouth of the Kwiniuk River. Elapsed time required to travel from release to observation at the tower site approximately 5 miles upriver was recorded.

Table 4. Kwiniuk River salmon redd excavation results, June, 1971.

| Sample No. | Date | Location | Volume of Gravel ft.$^3$ | No. of[1/] Eggs. | No. of[2/] Sac Fry | Eggs per ft.$^3$ of Gravel |
|---|---|---|---|---|---|---|
| 1 | 6/25 | Camp | 4.5 | 65 | 0 | 14.4 |
| 2 | 6/25 | Camp | 9.0 | 35 | 14 | 3.9 |
| 3. | 6/27 | Camp | 7.0 | 18 | 0 | 2.6 |
| 4. | 6/30 | Tower | 8.0 | 55 | 1 (dead) | 6.9 |
| 5. | 6/30 | Tower | 8.0 | 20 | 0 | 2.5 |
| 6. | 6/30 | Tower | 8.0 | 55 | 0 | 6.9 |
| TOTALS | | | 44.5 | 248 | 15 | 5.6 |

1/ Approximately 5% live by estimation.

2/ Some live sac fry were found in redd 2, however, the numbers of live fry were not recorded.

Appendix Table 1. Daily total cumulative salmon escapement, Kwiniuk River, 1965-1971.

| Species | Date | YEAR 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 |
|---|---|---|---|---|---|---|---|---|---|
| Chum | 6/18 | 6 | | | | | | | |
| | 6/19 | | 24 | | | | | | |
| | 6/20 | | 50 | | | | | | |
| | 6/21 | | 158 | | | | | | |
| | 6/22 | | 506 | | | | | | |
| | 6/23 | | 759 | | | | | | |
| | 6/24 | | 1,048 | 5 | 66 | | | | |
| | 6/25 | | 597 | 24 | 231 | | 2 | | |
| | 6/26 | | 1,060 | 77 | 1,066 | 57 | 17 | 23 | |
| | 6/27 | 218 | 1,189 | 270 | 1,812 | 113 | | 51 | |
| | 6/28 | 983 | 1,697 | 315 | 2,838 | 427 | | 95 | |
| | 6/29 | 2,576 | 1,768 | 1,455 | 3,509 | 571 | 645 | 139 | |
| | 6/30 | 3,445 | 2,180 | 2,148 | 4,433 | 1,475 | 2,302 | 196 | |
| | 7/1 | 7,741 | 5,728 | 2,739 | 5,971 | 2,057 | 3,327 | 452 | |
| | 7/2 | 8,794 | 7,619 | 3,027 | 6,914 | 2,744 | 6,420 | 728 | |
| | 7/3 | 9,988 | 8,054 | 3,491 | 8,427 | 3,861 | 14,467 | 1,181 | |
| | 7/4 | 11,050 | 10,050 | 5,647 | 9,409 | 6,056 | 20,873 | 3,362 | |
| | 7/5 | 12,078 | 11,958 | 6,157 | 10,247 | 7,137 | 26,699 | 4,783 | |
| | 7/6 | 12,602 | 13,184 | 9,605 | 12,345 | 8,107 | 30,596 | 6,178 | |
| | 7/7 | 13,455 | 13,703 | 13,088 | 14,950 | 9,514 | 31,468 | 6,651 | |
| | 7/8 | 13,824 | 15,703 | 15,691 | 16,637 | 10,568 | 34,695 | 10,677 | |
| | 7/9 | 15,630 | 17,503 | 18,513 | 17,920 | 11,727 | 40,012 | 11,539 | |
| | 7/10 | 19,147 | 17,472 | 21,487 | 18,201 | 12,197 | 40,362 | 13,401 | |
| | 7/11 | 2,818 | 19,551 | 23,459 | 18,266 | 12,577 | 44,180 | 16,902 | |
| | 7/12 | 23,491 | 24,549 | 26,165 | 18,332 | 15,200 | 47,305 | 18,694 | |
| | 7/13 | 26,444 | 27,225 | 26,473 | 18,348 | 14,198 | 47,738 | 19,346 | |
| | 7/14 | 32,026 | 27,579 | 26,495 | 18,481 | 14,879 | 50,304 | 20,566 | |
| | 7/15 | 32,190 | 28,604 | 26,532 | 18,507 | 16,057 | 56,948 | 20,858 | |
| | 7/16 | 32,437 | 28,336 | 26,584 | 18,518 | 16,364 | 60,275 | 21,909 | |
| | 7/17 | 32,503 | 28,844 | 26,598 | 18,553 | 17,117 | 62,577 | 26,955 | |
| | 7/18 | 32,861 | 29,965 | 26,625 | 18,677 | 18,283 | 63,065 | 27,836 | |
| | 7/19 | | 31,584 | 26,631 | 18,732 | 18,645 | 63,624 | 30,680 | |
| | 7/20 | | 32,154 | 26,681 | 18,764 | 18,856 | 65,673 | 33,800 | |
| | 7/21 | | 32,398 | 26,661 | 18,824 | 19,171 | 65,717 | 34,473 | |
| | 7/22 | | 32,723 | | 18,868 | 19,311 | 66,062 | 35,237 | |
| | 7/23 | | 32,938 | | 18,893 | 19,328 | 66,176 | 35,510 | |
| | 7/24 | | 33,030 | | | 19,463 | 66,336 | 36,185 | |
| | 7/25 | | 33,137 | | | 19,492 | 66,545 | 36,959 | |
| | 7/26 | | 33,153 | | | 19,687 | 66,584 | 37,680 | |
| | 7/27 | | 33,184 | | | | 66,599 | 38,107 | |
| | 7/28 | | 33,182 | | | | 66,602 | 38,186 | |
| | 7/29 | | | | | | 66,604 | 38,243 | |
| | | | | | | x | 2.1 1/ | x 2.1 | |
| | | | | | | = | 1,400 | = 803 | |
| | | | | | | + | 66,604 | +38,243 | |
| | | | | | | | 68,004 | 39,046 | |
| | | | | | | | | - 367 2/ | |
| | | | | | | | | 38,679 | |

1/. 1970 was the first year of 18 hour counts, 12 noon until 6:00 A. M. the next day. The average escapement for the hours from 6:00 A. M. until 12 noon for the years 1965-1969 was 2.1 percent of the total escapement for chums and 3.66 percent for pink salmon.

2/. Subsistence Catch.

Appendix Table 1. (continued) Daily total cumulative salmon escapement, Kwiniuk River, 1965-1971.

| Species | Date | YEAR 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 |
|---|---|---|---|---|---|---|---|---|---|
| Pink | 6/18 | | | | | | | | |
| | 6/19 | | | | | | | | |
| | 6/20 | | | | | | | | |
| | 6/21 | | | | | | | | |
| | 6/22 | | | | | | | | |
| | 6/23 | | | | | | | | |
| | 6/24 | | | | | | | | |
| | 6/25 | | | | | | 3 | | |
| | 6/26 | | | | | 17 | 13 | | |
| | 6/27 | | | | | 19 | 16 | | |
| | 6/28 | 174 | | | 48 | 41 | 17 | 9 | |
| | 6/29 | 260 | | | 214 | 52 | 47 | 12 | |
| | 6/30 | 220 | | | 534 | 117 | 198 | 31 | |
| | 7/1 | 276 | | 1 | 755 | 131 | 298 | 125 | |
| | 7/2 | 314 | 11 | 3 | 1,330 | 232 | 465 | 182 | |
| | 7/3 | 349 | 29 | 4 | 1,732 | 378 | 1,096 | 241 | |
| | 7/4 | 396 | 317 | 6 | 2,501 | 1,165 | 4,643 | 552 | |
| | 7/5 | 388 | 517 | | 3,141 | 2,259 | 10,949 | 819 | |
| | 7/6 | 390 | 533 | | 4,777 | 3,974 | 20,413 | 1,221 | |
| | 7/7 | 412 | 568 | 18 | 13,719 | 6,415 | 20,159 | 1,327 | |
| | 7/8 | 588 | 607 | 45 | 38,560 | 8,683 | 25,359 | 2,343 | |
| | 7/9 | 650 | 673 | 521 | 67,509 | 11,406 | 30,729 | 2,490 | |
| | 7/10 | 820 | 683 | 718 | 81,776 | 12,684 | 31,459 | 3,061 | |
| | 7/11 | 1,120 | 722 | 1,282 | 105,977 | 13,539 | 39,601 | 5,963 | |
| | 7/12 | 1,526 | 758 | 1,926 | 112,512 | 15,477 | 50,921 | 6,462 | |
| | 7/13 | 1,653 | 817 | 2,685 | 112,851 | 18,250 | 52,800 | 6,994 | |
| | 7/14 | 2,856 | 898 | 3,138 | 112,775 | 19,379 | 59,521 | 7,418 | |
| | 7/15 | 4,488 | 1,205 | 3,160 | 114,032 | 25,056 | 90,681 | 7,519 | |
| | 7/16 | 7,301 | 1,008 | 3,320 | 114,546 | 27,850 | 127,335 | 7,732 | |
| | 7/17 | 7,456 | 1,206 | 3,348 | 116,700 | 33,907 | 148,750 | 9,646 | |
| | 7/18 | 7,571 | 1,771 | 3,380 | 120,920 | 40,106 | 155,935 | 10,401 | |
| | 7/19 | 8,668 | 3,269 | 3,406 | 124,038 | 43,083 | 161,963 | 12,470 | |
| | 7/20 | | 3,894 | 3,432 | 125,376 | 46,812 | 179,160 | 13,938 | |
| | 7/21 | | 4,190 | 3,567 | 126,616 | 51,129 | 185,247 | 14,571 | |
| | 7/22 | | 5,558 | 3,587 | 127,530 | 53,363 | 198,958 | 15,123 | |
| | 7/23 | | 6,777 | | 127,994 | 53,958 | 208,403 | 15,309 | |
| | 7/24 | | 7,843 | | 128,580 | 54,927 | 214,233 | 15,485 | |
| | 7/25 | | 10,015 | | | 55,403 | 222,209 | 15,658 | |
| | 7/26 | | 10,691 | | | 56,683 | 225,546 | 15,818 | |
| | 7/27 | | 10,798 | | | | 226,712 | 15,996 | |
| | 7/28 | | 10,864 | | | | 226,829 | 16,089 | |
| | 7/29 | | | | | | 226,831 | 16,151 | |
| | | | | | | | x 3.66% 1/ | x 3.66% | |
| | | | | | | | = 8,300 | = 591 | |
| | | | | | | | + 226,831 | + 16,151 | |
| | | | | | | | 235,131 | 16,742 | |
| | | | | | | | | - 108 2/ | |
| | | | | | | | | 16,634 | |

1/. Subsistence catch.

Appendix Table 2. Total counts by hour showing percentage of total count for the years 1965-1969.

Species: Chums

| Year | 1965 | | 1966 | | 1967 | | 1968 | | 1969 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Hour | Count | % | Count | % | Count | % | Count | % | Count | % | All years |
| 00-01 | 2043 | 6.27 | 904 | 3.67 | 880 | 3.18 | 2214 | 11.7 | 753 | 3.8 | 5.72 |
| 01-02 | 1938 | 5.95 | 1255 | 5.10 | 917 | 3.31 | 1355 | 7.1 | 356 | 1.8 | 4.65 |
| 02-03 | 627 | 1.93 | 967 | 3.93 | 487 | 1.76 | 735 | 3.9 | 84 | 0.4 | 2.38 |
| 03-04 | 405 | 1.24 | 654 | 2.66 | 353 | 1.27 | 720 | 3.8 | 284 | 1.4 | 2.07 |
| 04-05 | 186 | 0.57 | 224 | 0.91 | 111 | 0.40 | 314 | 1.7 | 279 | 1.4 | 0.99 |
| 05-06 | 131 | 0.40 | 58 | 0.24 | 123 | 0.44 | 27 | 0.1 | 292 | 1.5 | 0.53 |
| 06-07 | 121 | 0.37 | 13 | 0.005 | 60 | 0.22 | 40 | 0.2 | 46 | 0.2 | 0.20 |
| 07-08 | 66 | 0.20 | 80 | 0.33 | 53 | 0.19 | 66 | 0.3 | 181 | 0.9 | 0.38 |
| 08-09 | 60 | 0.18 | -25 | 0.0 | 16 | 0.06 | 22 | 0.1 | 186 | 0.9 | 0.24 |
| 09-10 | 35 | 0.11 | -19 | 9.0 | 67 | 0.24 | 33 | 0.2 | 72 | 0.4 | 0.19 |
| 10-11 | 118 | 0.36 | 7 | 0.003 | 287 | 1.04 | 22 | 0.1 | 51 | 0.3 | 0.36 |
| 11-12 | 98 | 0.30 | -2 | 0.0 | -161 | -0.58 | 35 | 0.2 | 77 | 0.4 | 0.06 |
| 12-13 | 305 | 0.94 | 161 | 0.66 | 22 | 0.08 | -4 | 0.0 | 161 | 0.8 | 0.49 |
| 13-14 | 1523 | 4.68 | 147 | 0.60 | 495 | 1.79 | 69 | 0.4 | 1128 | 5.7 | 2.63 |
| 14-15 | 3386 | 10.40 | 483 | 1.96 | 496 | 1.79 | 440 | 2.3 | 963 | 4.9 | 4.27 |
| 15-16 | 1677 | 5.15 | 792 | 3.22 | 788 | 2.84 | 833 | 4.4 | 749 | 3.8 | 3.88 |
| 16-17 | 1556 | 4.78 | 1369 | 5.57 | 2937 | 10.6 | 879 | 4.6 | 1830 | 9.3 | 6.97 |
| 17-18 | 3961 | 12.16 | 1962 | 7.98 | 2519 | 9.09 | 698 | 3.7 | 2180 | 11.0 | 8.78 |
| 18-19 | 2777 | 8.53 | 2031 | 8.25 | 2304 | 8.31 | 1282 | 6.8 | 1995 | 10.1 | 8.39 |
| 19-20 | 2387 | 7.33 | 3392 | 13.78 | 3836 | 13.8 | 1947 | 10.3 | 1606 | 8.1 | 10.66 |
| 20-21 | 1863 | 5.72 | 2798 | 11.36 | 3600 | 13.0 | 1786 | 9.4 | 2109 | 10.7 | 10.03 |
| 21-22 | 2289 | 7.03 | 3523 | 14.30 | 3093 | 11.2 | 1409 | 7.4 | 1770 | 9.0 | 9.78 |
| 22-23 | 3082 | 9.47 | 2226 | 9.06 | 2412 | 8.7 | 1462 | 7.7 | 1180 | 6.0 | 8.18 |
| 23-24 | 1927 | 5.92 | 1574 | 6.40 | 2017 | 7.28 | 2586 | 13.6 | 1470 | 7.4 | 8.12 |
| Totals | 32561 | 99.99 | 24574 | 99.98 | 27712 | 100.5 | 18970 | 100.0 | 19802 | 100.2 | 99.95 |

Appendix Table 2. (continued) Total counts by hour showing percentage of total count for the years 1965-1969.

Species: Pinks

| Year | 1965 | | 1966 | | 1967 | | 1968 | | 1969 | | All years |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Hour | Count | % | Count | % | Count | % | Count | % | Count | % | % |
| 00-01 | 526 | 6.76 | 22 | 0.02 | 140 | 4.1 | 9974 | 7.6 | 3211 | 5.6 | 4.81 |
| 01-02 | 267 | 3.43 | 310 | 3.08 | 247 | 7.3 | 10457 | 8.1 | 1432 | 2.5 | 4.88 |
| 02-03 | 179 | 2.30 | 603 | 6.00 | 107 | 3.1 | 2403 | 1.8 | 270 | 0.5 | 2.74 |
| 03-04 | 142 | 1.82 | 428 | 4.25 | 113 | 3.3 | 2319 | 1.7 | 2227 | 3.9 | 2.99 |
| 04-05 | 80 | 1.03 | 57 | 0.06 | 7 | 0.2 | 2161 | 1.6 | 1833 | 3.2 | 1.21 |
| 05-06 | 81 | 1.04 | 28 | 0.03 | 15 | 0.3 | 661 | 0.5 | 1325 | 2.3 | 0.83 |
| 06-07 | 58 | 0.75 | 10 | 0.01 | 14 | 0.3 | 431 | 0.3 | 158 | 0.3 | 0.33 |
| 07-08 | 50 | 0.64 | 3 | 0.00 | 19 | 0.5 | 1861 | 1.4 | 2300 | 4.0 | 1.30 |
| 08-09 | 22 | 0.28 | 4 | 0.00 | 5 | 0.1 | 796 | 0.6 | 842 | 1.5 | 0.49 |
| 09-10 | 17 | 0.22 | -7 | 0.00 | 10 | 0.3 | 152 | 0.1 | 102 | 0.2 | 0.16 |
| 10-11 | 87 | 1.12 | -310 | 0.00 | 15 | 0.4 | 317 | 0.2 | 116 | 0.2 | 0.38 |
| 11-12 | 95 | 1.22 | -2 | 0.00 | 26 | 0.7 | 287 | 0.2 | 0 | 0.0 | 0.42 |
| 12-13 | 90 | 1.16 | -1 | 0.00 | 21 | 0.6 | 206 | 0.2 | 173 | 0.3 | 0.45 |
| 13-14 | 142 | 1.82 | 11 | 0.01 | 74 | 2.2 | 1395 | 1.1 | 2136 | 3.7 | 1.76 |
| 14-15 | 459 | 5.90 | 26 | 0.03 | 162 | 4.7 | 1796 | 1.4 | 1529 | 2.7 | 2.94 |
| 15-16 | 598 | 7.68 | 40 | 0.04 | 80 | 2.4 | 3711 | 2.9 | 2142 | 3.7 | 3.34 |
| 16-17 | 655 | 8.41 | 490 | 4.87 | 119 | 3.5 | 7701 | 6.0 | 4346 | 7.6 | 6.07 |
| 17-18 | 526 | 6.76 | 1221 | 12.13 | 227 | 6.6 | 14492 | 11.2 | 3445 | 6.0 | 8.53 |
| 18-19 | 546 | 7.01 | 851 | 8.45 | 240 | 7.1 | 6524 | 5.1 | 3153 | 5.5 | 6.63 |
| 19-20 | 534 | 6.86 | 1323 | 13.18 | 551 | 16.2 | 19821 | 14.8 | 4830 | 8.4 | 11.88 |
| 20-21 | 580 | 7.45 | 1822 | 18.18 | 377 | 11.1 | 8767 | 6.7 | 7928 | 13.8 | 11.44 |
| 21-22 | 770 | 9.89 | 1609 | 15.98 | 300 | 8.7 | 9921 | 7.6 | 49391 | 8.6 | 10.15 |
| 22-23 | 768 | 9.87 | 926 | 9.21 | 314 | 9.2 | 10137 | 7.8 | 3451 | 6.0 | 8.41 |
| 23-24 | 513 | 6.59 | 602 | 5.98 | 242 | 7.1 | 13092 | 10.1 | 5543 | 9.6 | 7.87 |
| Totals | 7785 | 100.1 | 10066 | 101.51 | 3425 | 100.0 | 129382 | 99.0 | 43615 | 100.1 | 100.01 |

Appendix Table 3. Chum and Pink Salmon escapements[1], Kwiniuk River, 1965-1971.

| Year | Chum | Pink | Total |
|---|---|---|---|
| 1965 | 26,634 | 8,301 | 34,935 |
| 1966 | 32,786 | 10,629 | 43,415 |
| 1967 | 24,444 | 3,508 | 27,952 |
| 1968 | 18,813 | 126,764 | 145,577 |
| 1969 | 19,687 | 56,683 | 76,370 |
| 1970[2] | 68,004 | 235,131 | 303,135 |
| 1971[2] | 38,679 | 16,634 | 55,313 |
| 1972 | | | |
| 1973 | | | |

1/. Tower count minus upriver subsistence catch.

2/. Expanded data.